

CHEMICALS

Project Fact Sheet



CHEMICAL INDUSTRY CORROSION MANAGEMENT

BENEFITS

- Improved accuracy in equipment lifetime predictions
- Energy savings of 18.5 trillion Btu by 2020
- Improved process safety and operations
- Reduced maintenance costs and expenses
- Reduced emissions of CO₂ and other pollutants

APPLICATIONS

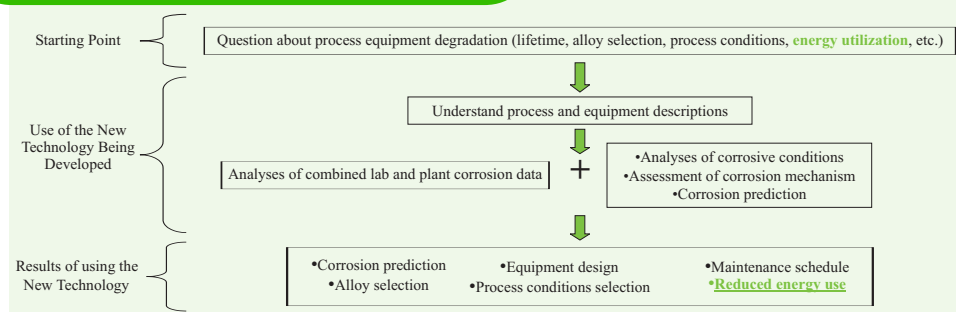
Data for corrosion by Cl₂ and HCl gases and corrosion prediction methods will benefit the forest products and chemicals industry, with applications in chemical processes, incinerators, burning chlorinated materials, and bleaching operations in paper manufacturing. Cyclic oxidation data will be applicable to the chemicals, steel, heat treating, and petroleum industries. Metal dusting data will be applicable to the steel, chemicals and petroleum industries.

IMPROVED CORROSION MANAGEMENT COULD PROVIDE SIGNIFICANT COST AND ENERGY SAVINGS FOR THE CHEMICAL INDUSTRY

In the chemical industry, corrosion is often responsible for significant shutdown and maintenance costs. Shutdowns are costly in terms of productivity losses, restart energy, and material costs. Additionally, internal corrosion failures result in contamination of products and process streams, and external corrosion leaks create undesirable safety, personnel, and environmental hazards. These shortcomings could be reduced by improving the capability for engineers to better predict corrosion of alloys in many different conditions.

We have a significant opportunity to increase the accuracy used in predicting equipment lifetimes, as they are limited by corrosion in high-temperature gases. Researchers are developing corrosion data for commercial alloys, thermochemical models, and understanding, which will be delivered to plant designers and operators via an information system to allow industry to comprehensively and reliably predict corrosion of an extensive list of commercial alloys exposed to complex and corrosive gases at temperatures ranging from 200 °C to 1,200 °C. Benefits from improving corrosion management will be extensive in the chemical industry, many other industries and the U.S. economy. Examples are improvements in process safety, reduction in maintenance costs of process operation, more cost-effective use of expensive alloys in equipment designs, reductions in energy use, moderation in the release of CO₂ and other pollutants to the atmosphere, and more confident use of alloys in progressively more extreme operating conditions. With improvements in corrosion management, equipment maintenance will be better scheduled, and unplanned outages due to unexpected corrosion will be reduced. Estimated annual energy savings by 2020 are 18.5 trillion Btu of CH₄.

SAVING ENERGY WITH THE NEW CORROSION TECHNOLOGY



Corrosion management development process.



Project Description

Goal: To develop new corrosion technology and to deliver it via an information system that will allow the chemical industries to better manage corrosion of metals and alloys used in high-temperature process equipment through improved prediction of corrosion-limited lifetimes and corrosion mechanisms.

The project's effort in corrosion technology combines comprehensive corrosion databases and thermochemical models and calculation programs to predict the dominant corrosion process. Metal losses by corrosion can then be calculated for commercial alloys over wide ranges of corrosive environments. The corrosion modes to be studied include corrosion by Cl_2/HCl gases, cyclic oxidation, and metal dusting.

The effort will generate several different types of corrosion data. Data for corrosion by Cl_2/HCl gases will be measured under conditions relevant for this mechanism, including temperature, time, gas composition, alloy composition, and mass transport characteristics as influenced by gas flow over metal surfaces. Thermal cycling generally influences oxidation behavior, but it can also promote additional forms of degradation such as thermal fatigue. Generation of meaningful cyclic oxidation data poses a difficult challenge, due to the diversity of the many potential thermal challenges. With regards to metal dusting, researchers intend to create a capability to compile all available data to help in assessments of the tendencies for alloys and metals towards metal dusting in commercial conditions and to predict metal dusting-limited lifetimes, as defined either by incubation times before onset of metal dusting or by metal loss rates once metal dusting begins.

Progress and Milestones

The four main tasks are summarized below:

- Software development
- Thermochemical modeling
- Corrosion testing/corrosion technology development
- Commercialization

Commercialization

Developed technology will be transferred to industry through the member companies. The effort will be assisted with semi-annual meetings, electronic communication, software updates and presentations to industry conferences. The Materials Technology Institute will distribute the technology to more than 50 chemical companies and their suppliers.



PROJECT PARTNERS

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